

Programme of
**Humboldt Kolleg on Synthetic
Quantum Matter**
2-6 July 2023



Alexander von
HUMBOLDT
STIFTUNG

To be held at **Hotel** Courtyard by Marriott Vilnius City Center Rinktinės st. 3, Vilnius, Lithuania

Monday, July 3rd

ABSTRACTS

8:45 – 9:15


Rebecca Großmann 

(Programme Director, Division Europe, Alexander von Humboldt Foundation, Bonn)

Alexander von Humboldt Foundation – Programmes and Activities

Session 1

9:15 – 9:40

 **Gershon Kurizki** (Weizman Institute, Israel)


Nonlinear Filtering of Quantum Noise for Sensing and Work

9:40 – 10:05

 **Kazimierz Rządewski** (Centre for Theoretical Physics, PAN, Warsaw)

The Fock States Sampling method at work

10:05 – 10:30

 **Eugene Demler** (ETH Zurich, Switzerland)

Quantum Simulations of the Fermi Hubbard model


Session 2

11:10 – 11:35

 **Karol Życzkowski** (Jagiellonian University, Krakow, Poland)

Synthetic Quantum states: maximal entanglement between arbitrary selected subsystems

11:35 – 12:00

 **Florian Mintert** (Imperial College London)

Quantum simulations of time-dependent Hamiltonians


12:00 – 12:25

 **Michael Fleischhauer** (University of Kaiserslautern, Germany)

To thermalize or not? Slow particle diffusion in Many-Body Localization

Session 3

14:00 – 14:25

 **André Eckardt** (TU Berlin, Germany)


Floquet engineering of open quantum systems

14:25 – 14:50

 **Cheng Chin** (University of Chicago, USA)

Quantum many-body chemistry: Collective Reactions of atomic-molecular Bose-Einstein condensates

14:50 – 15:15

 **Ite Albert Yu** (National Tsing Hua University, Taiwan)

Stationary Dark-State Polaritons Dressed by Rydberg Dipole-Dipole Interaction – A Feasible Platform for the Polariton Bose-Einstein Condensation

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Session 4	
15:50 – 16:15	 Emilia Witkowska (Institute of Physics, PAS, Warsaw, Poland) <i>Scalable spin squeezing in isotropic Heisenberg spin chains with nearest neighbour interactions</i>
16:15 – 16:40	 Natalia Korolkova (University of St Andrews, UK) <i>Coherent Diffusive Photonics: Quantum engineering by nonlocal loss</i>
16:40 – 17:05	 Ludwig Mathey (University of Hamburg, Germany) <i>Rotation sensor, critical dynamics and Rydberg quantum gates based on ultracold atom systems</i>
17:05 – 17:30	 Nikolay V Vitanov (Sofia University, Bulgaria) <i>Quantum Control of Qubits on IBM Quantum</i>
Tuesday, July 4 th	
Session 5	
9:00 – 9:25	 Reiner Blatt (University of Innsbruck, Austria) <i>Quantum Computation and Quantum Simulation with Strings of Trapped Ca⁺ Ions</i>
9:25 – 9:50	 Florian Schreck (University of Amsterdam) <i>Continuous Bose-Einstein condensation and superradiant clocks</i>
9:50 – 10:15	 Christof Weitenberg (University of Hamburg, Germany) <i>Matter-wave microscopy of ultracold atoms in tunable optical lattices</i>
Session 6	
10:50 – 11:15	 Nir Davidson (Weizman Institute, Israel) <i>Simulating XY spins with coupled lasers</i>
11:15 – 11:40	 Robert Spreuw (University of Amsterdam, The Netherlands) <i>From an Optical Magnus Effect to a Novel Quantum Gate</i>
11:40 – 12:05	 Grazia Salerno (Aalto University, Finland) <i>Topological bound states in the continuum of plasmonic lattices</i>
12:05 – 12:30	 Iacopo Carusotto (University of Trento, Italy) <i>Linear and nonlinear edge dynamics of trapped fractional quantum Hall droplets</i>

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Wednesday, July 5 th		Session 7
9:00 – 9:25	 Laurent Sanchez-Palencia (CNRS and Ecole Polytechnique, France) <i>Strongly Interacting Bosons in a Two-Dimensional Quasicrystal Optical Potential</i>	
9:25 – 9:50	 Krzysztof Jachymski (Warsaw University, Poland) <i>Charged impurities in a bosonic bath</i>	
9:50 – 10:15	 Luca Barbiero (Politecnico di Torino, Italy) <i>Engineering non-local interactions and geometrical frustration in synthetic quantum matter</i>	
		Session 8
11:00 – 11:25	 Richard Fletcher (MIT, USA) <i>Quantum Hall physics in a quantum Foucault pendulum</i>	
11:25 – 11:50	 Peter Krüger (University of Sussex, UK / PTB Berlin, Germany) <i>Atomic gases as probes: from dimensional crossovers to current-density imaging</i>	
11:50 – 12:15	 Oded Zilberberg (University of Konstanz, Germany) <i>Classical to quantum extended rotating frames</i>	
		Session 9
14:00 – 14:25	 Tilman Pfau (Stuttgart University, Germany) <i>A molecular bond between ions and Rydberg atoms</i>	
14:25 – 14:50	 Krzysztof Sacha (Jagiellonian University, Krakow, Poland) <i>Absolutely Stable Discrete Time Crystals</i>	
14:50 – 15:15	 Matthew Eiles (Institute for Physics of Complex systems, Germany) <i>Rydberg molecules, composites, and polarons</i>	

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Session 10

16:00 – 16:25



Andrea Alberti (University of Bonn, Germany)

A Quantum Computer Demonstrator with Ultracold Sr Atoms

16:25 – 16:50



Nur Ünal (University of Cambridge, UK)

Topology in multi-level systems and non-Abelian Floquet braiding

16:50 – 17:15



Stefan Scheel (University of Rostock, Germany)

Non-Abelian geometric phases in integrated photonic waveguide structures